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Foods

Their Nutritive Value
and Digestibility

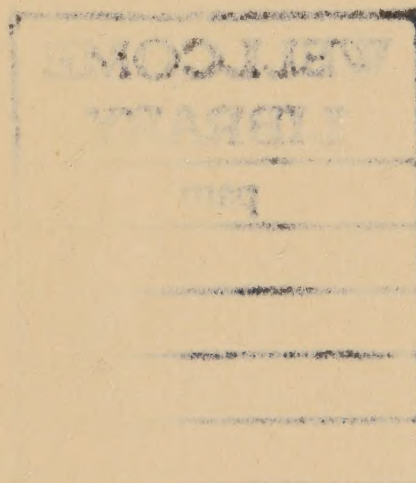


Susanna Cocroft

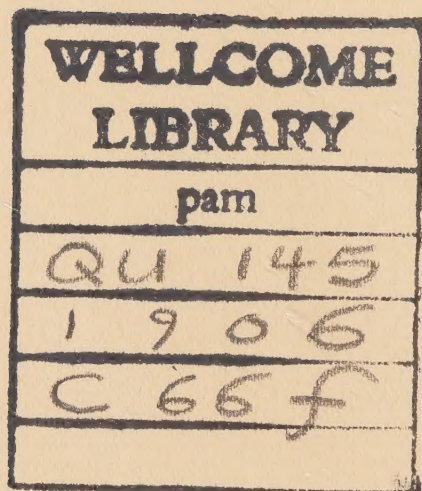


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FOODS
THEIR NUTRITIVE VALUE
AND DIGESTIBILITY



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FOODS

THEIR NUTRITIVE VALUE AND DIGESTIBILITY

BY

SUSANNA COCROFT

The problem of proper nutrition for the body is as vital as any study affecting the morals, health and the consequent power of a nation, since upon the kind, quality and quantity of food depend the sustenance, health and strength of its citizens. Happily the United States Government, realizing this, has established experimental and analytical food departments, and is disseminating its knowledge freely and widely. This means an important step toward the health and strength of body, brain and brawn of its citizens. The German Emperor, realizing that the health and strength of his subjects are menaced by the use of improper food, has gone one step farther, by carefully supervising the nature of all foods manufactured within, or imported into his domain.

Scientific research along the lines of electricity, psychology, metaphysics, medicine and art, has been tenaciously pursued for centuries; yet scientific study of the natural means of keeping the body in health, that the individual may be in physical, mental and moral condition to enjoy and to profit by researches made in other lines, has been neglected. Careful study of the chemical components of foods, and the attempt to control the foods placed upon the market, is comparatively recent. The "pound of cure," in the study of materia medica, has been given

much thought,—the “ounce of prevention,” little. The result is, that the mass of mankind is not in physical condition to enjoy life in its exuberant fullness.

The entire body,—bone, muscle, blood, brain, nerve, heat, energy and consequent activity of brain and body, are all formed from the foods assimilated.

Every particle of body substance is constantly changing, and the new material for cells and tissues; substance to supply the energy needed in the metabolic work of tearing down and rebuilding these cells and tissues; energy used in the digestive process of converting the food into condition to be assimilated, and the energy used in muscular, brain and nerve movement, must all be supplied by food.

Every brain effort in the process of thinking, as well as every emotion, requires energy which the food must supply, just as each muscular movement must be supplied. Brain workers, or habitual worriers, use up force and become thin quite as quickly as those whose work is muscular.

The term “brain workers” is commonly applied to professional men or women, to authors, editors or teachers, but the woman who manages her household judiciously, or the woman who spends her life fretting under existing conditions, or worrying over things which never happen, uses quite as much brain force; the difference being that the former accomplish results outside of themselves, while the latter simply stirs up disagreeable conditions within, resulting in physical illness.

The whole problem of perfect health and efficient activity is in keeping the supply of assimilated food equal to the demand.

The body is certainly a marvelous machine; it is self-building, self-repairing, and to a degree self-regulating. In addition to the above, it must supply the energy with which to repair its waste; must direct its own emotions; must supply the energy for these emotions; must discriminate and cast out refuse, and food not needed for its purpose; must form brain cells and create mental

force, with which to control the organism; must keep in repair the nerves, which are the telegraph wires, connecting the brain with the body; must convert the potential energy in the food into heat, with which to keep it warm; and withal it is not left free to do its work automatically. It has within it a higher intelligence, a spiritual force, which may definitely hamper its workings by getting a wrong control of the telegraph wires, thus interfering with the digestion, with the heart action, the lungs and with all metabolic changes. The right exercise of this higher intelligence depends partially upon the condition of the body, because the machine out of repair hampers mental and spiritual control. Surely man is marvelously made, and "Behold, He that keepeth Israel must neither slumber nor sleep."

The intelligent care of the body,—which is merely the temple in which the soul abides, and through which it communicates with material conditions,—is a sacred Christian duty. "The priest with liver trouble and the parishioner with indigestion, do not evidence that skilled Christian living, which is so essential to the higher life." The physical satisfactions of life, the joys of mental development, the inspiration of soul, the sense of growth, of expansion, and of largest happiness, the self-satisfaction of greatest usefulness, and the glorifying results of this usefulness, come in largest measure only to the person whose nutriment is proper in quantity, quality and form and is taken properly, as to time, mastication, swallowing and digestion, with sufficient exercise to give the body activity to convert it into use. This enjoyment of vibrant life is far beyond the joys of the intemperate or the æsthetic.

Certain it is that improper foods in kind and quantity affect the disposition, retard the spiritual growth and change the drift of one's life and the lives about one.

Man has become so engrossed in the demands of social and civic life, that he forgets to apply the intelligence, which he puts into his business, to the care of the machine which does the work. He is hedged about in a complex net-work of social, civic and domestic habits which call

for undue energy and annoyance. The simple laws of nature, in the care of the body, are plainer and easier to follow than the complex habits which he forms. The "simple life" embraces the habits of eating, as well as the habits of doing and of thinking.

It is commonly stated that the body will call for what the system requires. This may have been true of the aborigines, who ate their food in its natural state, but condiments and stimulants, to make the food "appetizing," have perverted the natural taste, and foods containing their natural amount of spices or extractives no longer tempt one.

The prepared foods, in fact, nearly all foods, sold by the manufacturers, contain an undue amount of adulterants and stimulants. These stimulants create an abnormal appetite, so that more of the food is consumed than the system would normally demand, and the digestive organs are overloaded.

There is a difference between the cultivated and the normal appetite. A child rarely shows a desire for stimulants or condiments, unless unwisely encouraged by an adult,—not because it is good for the child, but because the one who encourages it has cultivated a taste for it. It is as easy to form healthful tastes and habits of eating as unhealthful ones, and care should especially be exercised in the formation of healthful habits of the growing child.

The simple foods, in their natural state, are in a right condition to be digested, with the aid of heat to break the cellular coverings of the globules of some of them, but time, energy, muscular activity, nerve force and money are spent in combining, stimulating and cooking foods in such a manner as to render them difficult of digestion.

Experiments are being made to determine the advisability of salting food. Too much salt extracts water from the blood, causing, in some cases, a dropsical condition, and, in view of the fact that the salt consumed must pass from the body, either through the skin or the kidneys, the kidneys sometimes become overloaded, resulting in Bright's disease. Prof. Bunge, of the Swiss

University of Basle, one of the most eminent chemists of the world, says that the amount of salt eaten by the average man is four or five times more than the system requires. Natural salts are particularly abundant in vegetables and fruits, and these require the least seasoning.

Each individual should know approximately the chemical constituents and the proportion of these constituents in his blood, for from the elements in the blood, the tissues of the body are constructed. He should then study the amount of re-supply required to renew the daily waste, and the kind of foods required to re-supply any elements which may be lacking.

Each meal, or each day's food, may not contain just the amounts of proteid, or of fuel ingredients necessary for that day's work and re-supply, but the body is continually storing material, and this reserve is constantly being drawn upon to re-supply any one element which may be lacking in that day's food. Thus, an excess, or a deficiency one day, may be adjusted the next. Healthful nourishment requires that the balance, as a whole, be kept, and that a deficiency or over-supply be not continued for too long.

Nature provided for an incomplete knowledge of the amount of re-supply necessary, by enabling the system to carry off a limited amount of surplus food above the bodily requirements, but that the waste, as well as the surplus, may be removed, and the new food be converted into use, a normal amount of daily physical exercise is required to keep in activity every vital function, that the metabolic work of building and tearing down tissues may be actively kept up. This work of tearing down and rebuilding body tissue never ceases—even in sleep.

The purpose of food is:

1st. To supply the material of which the body is made (particularly in the building of new tissues in the growing child).

2nd. To repair the waste;

3rd. To produce heat;

4th. To produce muscular and mental energy.

**Chemical
Compounds
of the Body.**

The chemical substances, supplied by foods, should be the same as those found in the body. Of the fifteen to twenty substances comprising the body structure, the most abundant are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorous and sulphur.

All living matter, plant or animal, contains oxygen, hydrogen, carbon and nitrogen, the difference being in the different proportions of the above elements.

The plant takes its food elements from the air, water and soil, and within its own cells converts these elements into compounds for growth and sustenance. Many domestic animals take their food elements from air and water together with the compounds which the plants have formed; while man, swine, cats, dogs and most wild animals, make use of the compounds formed by other animals, as well as the compounds formed by plants, the digestive forces of one animal having converted these elements into condition easily assimilated by another.

The foods which contain the above elements are divided into three classes, by reason of the special use of each—Proteids, Carbohydrates and Fats.

**Proteids or
Nitrogenous
Compounds.**

The proteids are the principal nitrogenous compounds,—they supply about eighteen per cent, or nearly one-fifth of the weight of the body; they make the framework of the body, forming the basis of blood, lymph, muscle, sinew, bone, skin, cartilage and other tissues. The proteids, as well as the fats and carbohydrates, furnish warmth and strength, but proteid alone forms muscle, bone and sinew. It is therefore the most important nutriment; it is also the most costly. Proteids are most abundant in the animal foods, yet they are found in smaller proportions in vegetables, particularly in beans and peas.

Proteid compounds are classified as,

Albuminoids;
Gelatinoids, and
Extractives.

The albuminoids include such foods as the lean of meat, the white of eggs, the gluten of wheat and the curd

(casein) of milk. They are the most important of the proteids, and they form blood corpuscles, muscle, bone and tissue.

The gelatinoids are next in importance; they are the ossein of bone, connective tissue, skin and tendons. While gelatinoids do not form muscle, they protect the tissues from being consumed, by supplying heat and energy, when carbohydrates and fats are lacking. If the gelatines upon the market were pure productions made from the bone and cartilage of good meat, they would be valuable food. The gelatine is distinguishable in rich meat soups, which jelly upon cooling.

The extractives are the meat extracts found in beef tea, etc. They differ from albuminoids and gelatinoids in that they neither build tissue, bone, nor furnish energy, but they contain nitrogen, hence they are classed as proteids; they are not nutriments, but merely appetizers and stimulants, and if supplied in too large proportions in food, they stimulate too large a consumption and overload the system.

The proteid foods may be again divided into three classes:

1st. The materials of vegetable origin, as beans, peas, nuts, lentils and the gluten of wheat;

2nd. Animal productions, as eggs, cheese, and the curd of milk;

3rd. Animal flesh.

Fat.

Fat does not make body tissue. It is stored in the body as carbon, to be consumed as fuel in creating heat and mental and physical energy.

Fat forms about fifteen per cent of the weight of the normal body, and it has about twice the fuel value of carbohydrate. Common examples of fats are butter, the fat of meats, nuts and the oil of grains and seeds,—notably, oatmeal and corn.

Manual laborers require more fat for energy than do people whose habits are sedentary. School children, or children who play hard, should have sufficient fat, and where fats are withheld, sugar should be supplied.

The amount of fat stored in the body depends upon

the amount of fat consumed with the food; upon the amount used up in heat and energy, in muscular exercise, or in mental force, and upon the condition of the nerves.*

Where fat is subjected to extreme heat, as in frying, reaction takes place, and volatile products are formed, which irritate the mucous membrane of the stomach and intestines and interfere with digestion, hence fried fat should be avoided.

**Carbo-
hydrates.**

The carbohydrates (starches and sugars) include such substances as the starches of vegetables, grains and fruits (notably corn, rice, wheat and the root vegetables), the sugar of milk, fruits and vegetables, and the fibre of plants. Rice is almost pure starch, wheat and other cereals contain from sixty to seventy per cent. Starch is formed by the living plant cells, and the sun's rays, from the carbon-dioxide and water in the air and the soil. The end of the plant life is the complete formation of its compounds.

Carbohydrates are almost entirely absent in animal foods, excepting in milk, the animal having converted them into fats.

All starch must undergo chemical change by action of the digestive juices and by the liver, before it can be used by the body, thus starchy foods should not be given to children before the starch converting ferments are formed, or to one in disease where these ferments are interrupted. Carbohydrates are easily digested, and their chief office is to create energy. They are really the "reserves" or "go-betweens" of the body—they are changed into fats and consumed as fuel.

The starches are chiefly stored up in the liver and if consumed in unduly large quantities, without sufficient exercise to burn them up, they overload the "storeroom" and clog the system.

Carbohydrates and fats are each composed of oxygen, carbon and hydrogen, the difference being that there is less oxygen in fat, hence more oxygen from the air is required for combustion of fat than of carbohydrate. One

*Publishers' Note.—See lecture upon "Obesity," by Susanna Cocroft.

pound of starch requires 1.2 pounds of oxygen for perfect combustion, while one pound of suet requires 3 pounds of oxygen.

When more fat or carbohydrate is taken than the daily amount of exercise consumes as fuel, the surplus is stored up for future use.

Water.

Water is a component part of all tissues and constitutes from sixty-eight to seventy-five per cent of the weight of the body. It is composed of oxygen and hydrogen. In order that the body may do efficient work in digestion, and in the distribution of the nutrient elements of the food, and that the evaporations from the body may be re-supplied, the water in the foods, together with the beverages drank, should consist of about 75 per cent liquids, to 25 per cent nutrient elements, or about three times as much in weight as proteids, fats and carbohydrates combined, and if for any reason undue evaporation or perspiration is occasioned, a larger proportion is required.

Water passes directly into the circulation without chemical change.

The average individual at normal exercise, requires about $71\frac{1}{2}$ ounces of water daily, which equals about 9 glasses (one glass of water weighs one-half pound); a part of this is consumed in the food. By reference to the tables on pages 23, 24 and 25, it will be noted that water forms a large percentage of all food, particularly of green vegetables and fruits.

The importance of water for children must not be overlooked. It is the heat regulator of the body, and the more energy used, either in work or in play, which results in more heat and evaporation, the more water is required. Water is being evaporated constantly through the lungs and the skin, and every forty-five seconds it passes from the kidneys into the bladder.

The body will subsist for weeks upon the food stored about its tissues; it will even consume the tissues themselves, but it would burn itself up without water. Few people give much thought to its re-supply, yet they suffer

from the loss of it in imperfect digestion and assimilation, and with kidney and intestinal difficulties, ignorant of the cause.

Water should be furnished freely, in small quantities at a time, to fever patients. An animal, if warm, immediately seeks water.

Minerals.

Mineral matter occurs in all of the ordinary foods, —meats, vegetables and fruits,—being most abundant in dried legumes (peas and beans). The minerals are chiefly in the bones and the teeth. They form from five to six per cent of the body's weight. It is the minerals of the food, or of the body, which form the ashes in burning. The basis of bone is phosphate of lime, or calcium phosphate. Other minerals necessary to the body are iron, sodium, potassium and magnesium.

“The muscles, ligaments and labor-performing structures, contain the largest amount of proteids: the fats and the carbohydrates contain the largest amount of carbonaceous compounds; the brain, the nerves and the bones contain the largest portion of phosphorous compounds; yet, while the brain contains phosphorous, and the muscles nitrogen, the brain cannot be built up by eating elementary phosphorous, nor the muscles by pure nitrogen, but compounds rich in phosphorous or nitrogen may be utilized. It has been demonstrated by scientific investigation that no unorganized element is assimilated by the system and converted into its various structures.”

Heat and Energy.

Heat is caused by the union of oxygen with hydrogen, but the exact process of the conversion into heat and energy of the bodily constituents, dormant in food, is not known; it is known, however, that oxygen is necessary to cause combustion of carbon in fat and carbohydrates, just as it is necessary to cause combustion of carbon in wood, or coal. The heat from “burning” wood is produced by the oxygen of the air uniting with the hydrogen and carbon, which forms carbon-dioxide (carbonic acid gas) and water. The light in the burning of wood is caused by the rapid combustion of the carbonic acid gas. The same combustion

occurs within the body continuously, though more slowly, hence no light is produced.

The fuel value of food depends upon the amount of fats and carbohydrates which it contains.

Fat is the most concentrated form of fuel; it is readily oxidized, and those who store up an abundance suffer most from a rise in temperature, because combustion not only creates heat, but heat also aids combustion.

A pound of fat has about three times as much fuel value as a pound of wheat flour, which consists largely of starch.

Fats are almost pure carbon, hence less chemical work is required to convert them into fuel, but more oxygen is needed.

In warm weather, little fat is needed for fuel, and nature provides fresh, green vegetables to replace the root vegetables of the winter, which, consisting largely of starches and sugars, are readily converted into heat, for in cold weather, especially in the high altitudes or latitudes, more is required to keep the body warm. The chief diet of the Eskimo is oil. Sugar and starches of bread and root vegetables are readily converted into fuel.

The carbon in the body is liberated and brought in contact with more oxygen in the blood, through exercise and full breathing, just as a fire is fanned to flame by bringing more oxygen in contact with the fire by means of a draught of air. Keep all air away from a fire and it "goes out," or ceases to unite with the oxygen, and no heat is produced; keep all air from within the body by cessation of breathing, and it also becomes cold. A room in which the air is impure, containing insufficient oxygen, is heated with difficulty.

The body will subsist 40 days upon the food stored within it, without re-supply, but it cannot endure 40 seconds without oxygen in the blood supplied by the lungs, because heat, occasioned by the union of oxygen with the carbon and hydrogen, is necessary to keep up the activity within the body, termed "life." The necessity of habits of full, correct breathing will be here noted.

The amount of oxygen daily consumed should fully equal the sum of all other food elements.*

Deep breathing aids digestion and assimilation, not alone because of the regular exercise given to the pancreas, the spleen, the stomach and the liver by the correct movement of the diaphragm, but because of the latent heat which the oxygen liberates within the digestive organs, and out among the tissues.

The effect of oxygen in the creation of heat is practically demonstrated by repeatedly filling the lungs with air while out in the cold. The body will become quickly warmed on the coldest day by this practice.

If sufficient fat is not consumed or is not formed from the carbohydrates, a certain amount of the proteid of the body is converted into fat and used in energy. When the food supply is short, or much energy is called for, the surplus supply of carbohydrates is first used and if the carbohydrates are not sufficient, the proteids are used. Of the proteids, the gelatinoids are used first, and next the albuminoids, or tissue builders. If the demand, either in mental or physical energy, exceeds the daily supply, for a length of time, the body becomes lean.

Heat and muscular power are expressions of energy. The potential energy latent in the food is partly released during the digestive process, as the elements of the food come in contact with the oxygen swallowed and with the digestive juices; this combustion gives to the digestive organs the necessary warmth for their effective work; digestive juices will not flow freely when the body is cold. The heat liberated during the digestive process is necessary, also, to put the elements of the food into condition for absorption, a certain amount of heat being required for the chemical changes. This liberated energy is expressed not alone in the chemical formation of the compounds, but in the peristaltic movements of the digestive organs.

Editor's Note.—Measurements of eighteen thousand women show that 62 per cent. of women use one-half of their lung capacity and less than 9 per cent. use their full capacity, as shown in my lecture upon "Breathing," bound with the Circulatory System.

Truly the body is a busy work-shop. Think of the billions upon billions of cells being formed and destroyed every instant in the liberation of heat and force. Think also of the necessity of perfect circulation to bring sufficient blood to the lungs, that it may gather the oxygen and carry it, without pausing for rest, to every tissue of the body. Even in sleep this stream continues incessantly.

About one-third of the food eaten goes to maintain the life of the body in doing its incessant work of repairing and rebuilding, the two-thirds is the reserve for usefulness outside of itself.

There is surely a great lesson in industry here, and one of the most profound studies in economics, physics and chemistry.

There is also a great lesson in the law of supply and demand. When the body is at mental or muscular work, the potential energy liberated, leaves the body through muscle or brain, as energy, and is expressed in the result of the work; when the body is at rest, it leaves it as heat (excepting such part as is necessary to carry on metabolism, circulation, etc.). If a great amount of muscular energy is called for, instinctively a deep, full breath is drawn to supply the oxygen necessary for the added force required.

If strong mental work is required, attention should be given to exercise and deep breathing the while, that the blood may carry off the waste liberated by brain activity. The difficulty is that in doing close mental work, the body is too frequently bent over a desk in such a manner as to restrict the action of the lungs; thus the brain worker, in order to continue strong mental work, must often go out in the open air,—as he says, “to rest his brain,” but in reality to re-supply the oxygen required to carry on his work. The supply for the body work has been called upon for the undue brain work, and this lack of oxygen has produced a state of body designated as “tired.” Until the necessary amount has been supplied, the brain and body are not balanced, not “rested.”

The amount of heat and energy given off from the body exactly equals the amount of latent energy released by material burned during oxidation.

While the elements of the food are being oxydized, the latent (potential) energy released by the oxygen creates mental and physical force and keeps active the metabolic changing of food into tissues and cells, known to physiologists as anabolism, also the changing of cells and tissues into waste, known as ketabolism.

It is to be noted also, that no force within the body is lost. In the very process of the removal of waste, heat and energy are created, so that the parts no longer needed are utilized by the system, while they are being removed from it. Here is a lesson in economy of force.

Scientists have a means of measuring the energy latent in food material, also the amount of heat given off in the oxidation of a given quantity of waste. The unit of measurement is the calorie,—the amount of heat which will raise 1 pound of water to 4 degrees Fahrenheit, or will lift 1 ton 1.54 feet.

The young child's blood circulates freely, his breathing is unrestricted, the waste of the system is fully burned up, potential energy is released and the result is, he must be active. The effort of the teacher, or of those having the care of children, should be, not to restrain the child, but rather to direct his activity in the useful and effective employment of his energy.

**Balance of
Force.**

Nothing is lost in Nature's distribution of force and energy. Everything accomplished in life, either in the physical handling of material, the brain work in planning the constructions, the mental movements of thought in art, literature or science, are all representatives of the heat and energy released from the body, and it is the effort of every man and woman to make the body yield as large an income as possible in the expression of this energy. In order that it may do so, it must be used with intelligence, just as any other great machine must be used intelligently; it must be fed, exercised and rested judiciously.

"Tired"
or
Disturbed
Balance.

The word "tired" indicates a lack of the normal amount of oxygen present within the body, or a supply not equal to the existing demand, or an uneven distribution of the oxygen. Mental tiredness is explained above.

The regular work of the body in keeping up the heart action, and the circulation, in renewing and relieving waste, requires a certain amount of oxygen and consequent energy; this amount, the system, in normal condition, with normal breathing, readily furnishes, but in muscular work, when the amount of energy used is more than the energy liberated, the energy required for the constant bodily needs is called upon, and the muscles, nerves and tissues are then in the state termed "tired," and remain so until sufficient oxygen has liberated more potential energy than is needed for body change. When a sufficient supply of oxygen has been consumed to equal the demand, the body is in a state of rest.

In mental work the nerves and the brain call for the surplus energy, while in muscular work the tissues require it, hence extreme mental work expresses itself in bodily fatigue, until the oxygen equals the demand in all parts of the body.

A torpid condition of body, producing inertia, means that the waste of the system is not relieved. It may be because of lack of oxygen by reason of insufficient breathing, or it may be because the circulation in some part of the body is clogged (most often the portal circulation through the liver), so that sufficient oxygen is not carried to that part. The waste matter, or carbonic acid gas, remaining in the body is a poison; it dulls the nerve sensations and the brain action. Relief from this torpor is experienced by exercise in the fresh air, that the circulation may be quickened and the oxygen more freely carried to each part. Exercise in one's room by the open window, or at least with the air in the room pure, is usually preferable to out-door exercises, because the body can be nude, or so loosely clothed that the oxygen may freely enter not only the lungs but the pores of the skin. Fifteen minutes of such exercise in one's room is better

than a five-mile walk, because if the exercises be intelligently selected, every organ and tissue is used, while walking exercises about one-fourth of the muscles. If the circulation be clogged, the exercise must be kept up persistently until the obstruction be removed.

In sleeping in a room with impure air one arises fatigued, because of insufficient oxygen to liberate the energy required for circulation and anabolism.

Undue work of brain or muscle causes an undue circulation of blood to carry sufficient oxygen to liberate energy in the parts being used, and the result is a distension of the capillaries in these parts.

The relief from the state of body we call "tired," then, is in the distribution of the circulation, calling the blood from the unduly distended capillaries, and supplying the normal amount of oxygen. *Rightly directed* physical culture renews the circulation to all parts, incites deep breathing and puts the body in the state of harmony called "rest."

Harmony, either mental or physical, is rest.

With a little more intelligence in keeping up the supply and demand of oxygen, in establishing correct breathing habits, and in understanding the law of distribution of circulation, which means the harmony of forces, this tired world could draw a deep, restful breath.

**What to
Eat.**

There is so much general discussion about food today, and yet so little definite, scientific information, that the puzzling question with the many, is: "What to eat?" Most of the articles are prefaced by, "Don't eat," etc.

Much is said also about the bacteria present in the atmosphere, the microbes in the foods, etc., until one is puzzled to know, not only what to eat, but what to breathe, and, in fact, which way to turn to avoid them; but microbes and bacteria have been present in the atmosphere and in matter everywhere since time began. They are a part of the natural surroundings, and the body, if kept in strong vitality, has sufficient resistive power to enable one to live among them, untouched by them. The danger

lies in allowing the system to run down and the vital force to ebb, so that the body becomes easy prey for them.

The diet should be a mixed one and varied from day to day and from season to season, with the aim to provide one-fourth proteid for tissue building in each day's food. Combinations can be made from the following tables.

It must be borne in mind that the nitrogenous vegetables do not contain sufficient proteid for tissue building; therefore where one refrains from the proteids of animal flesh, the amount must be supplied in the animal products, eggs, milk and cheese. Many vegetarians, who abstain from animal flesh, lack vital force because of their dependence upon vegetable proteids. It will be remembered that proteids are the most concentrated form of nutrition.

Exclusive use of partially digested, "predigested," "malted" or "peptonized" foods, must ultimately weaken digestion, because an organ not fully used, loses much of its power.

Meats digest with ease, the sheep or the ox having stored up the energy by converting the starches and sugars into a condensed form, which readily yields force in being transferred to man; thus the animal does a part of man's work by preparing condensed energy from the vegetable foods for him.

It must also be borne in mind that it is the amount of food digested and assimilated, rather than the food consumed, which counts. It is economy, therefore, to keep the digestive organs and the circulation and tissues strong in order that all foods eaten may yield returns instead of hampering activity.

Regularity
in Eating.

Much has been said of late in regard to the consumption of too much food and of a consequent overloading of the digestive system. As a relief, many theorists are advocating two meals a day, but the work of the average man is planned into morning and afternoon sessions, and the three meals have been arranged accordingly.

The argument in favor of two meals a day has been that the digestive system is inactive during sleep, and,

therefore, the system is not ready for a meal upon arising; but it must be borne in mind that the average evening meal is eaten about six o'clock and that there are about four waking hours between this meal and the sleep period, also that the average individual is awake and moderately active an hour before the morning meal. This gives five waking hours between the evening and the morning meal and the digestion does not entirely cease, though less active, during sleep. About the same time, five hours, elapses between the morning and the midday meal, and between the midday and the evening meal, so that three meals a day divides the waking digestion periods about evenly.

Where two meals a day are eaten, the first meal should be at 9 or 10 in the morning and the second meal at 5 or 6 o'clock in the afternoon; whereas the custom is for the average person who eats two meals a day, to go without food until the midday meal, and then to eat two meals within six hours, with nothing more for 18 hours.

More frequent meals, served in lighter amounts, with greater regularity, so that the system is not overloaded at any one meal, seems rational for delicate, undernourished nerves and tissues,—the little child is fed every two hours.

The examination of foods which the United States Government is now pursuing, and will doubtless pursue more thoroughly in the future, will insure better foods, less disease and greater strength of both muscle and brain. The investigation also shows what foods can be raised in this country with profit; new food products are being grown in consequence and it is shown that the number of imported foods may be decreased.

The following table showing the composition of the common American food products is prepared by W. O. Atwater, Ph. D., Special United States Government Agent in charge of the experiments upon the nutritive value and digestibility of foods in the Department of Agriculture, Washington, D. C. These tables show, without doubt, the results of the most reliable experiments made.

TABLE I.

AVERAGE COMPOSITION OF COMMON AMERICAN FOOD PRODUCTS.

Food Materials (as purchased).	Refuse.	Water.	Pro- tein	Fat.	Carbo- hydrates.	Ash	Fuel Value Per Pound.
ANIMAL FOOD.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calo- ries
Beef, fresh :							
Chuck ribs.....	16.3	52.6	15.5	15.0	-----	0.8	910
Flank.....	10.2	54.0	17.0	19.0	-----	.7	1,105
Loin.....	13.3	52.5	16.1	17.5	-----	.9	1,025
Porterhouse Steak.....	12.7	52.4	19.1	17.9	-----	.8	1,100
Sirloin Steak.....	12.8	54.0	16.5	16.1	-----	.9	975
Neck.....	27.6	45.9	14.5	11.9	-----	.7	1,165
Ribs.....	20.8	43.8	13.9	21.2	-----	.7	1,135
Rib rolls.....	-----	63.9	19.3	16.7	-----	.9	1,055
Round.....	7.2	60.7	19.0	12.8	-----	1.0	890
Rump.....	20.7	45.0	13.8	20.2	-----	.7	1,090
Shank, fore.....	36.9	42.9	12.8	7.3	-----	.6	545
Shoulder and clod.....	16.4	56.8	16.4	9.8	-----	.9	715
Fore quarter.....	18.7	49.1	14.5	17.5	-----	.7	995
Hind quarter.....	15.7	50.4	15.4	18.3	-----	.7	1,045
Beef, corned, canned, pickled, and dried :							
Corned Beef.....	8.4	49.2	14.3	23.8	-----	4.6	1,245
Tongue, pickled.....	6.0	58.9	11.9	19.2	-----	4.3	1,010
Dried, salted and smoked.....	4.7	53.7	26.4	6.9	-----	8.9	790
Canned boiled beef.....	-----	51.8	25.5	22.5	-----	1.3	1,410
Canned corned beef.....	-----	51.8	26.3	18.7	-----	4.0	1,270
Veal :							
Breast.....	21.3	52.0	15.4	11.0	-----	.8	745
Leg.....	14.2	60.1	15.5	7.9	-----	.9	625
Leg cutlets.....	3.4	68.3	20.1	7.5	-----	1.0	695
Fore quarter.....	24.5	54.2	15.1	6.0	-----	.7	535
Hind quarter.....	20.7	56.2	16.2	6.6	-----	.8	580
Mutton :							
Flank.....	9.9	39.0	13.8	36.9	-----	.6	1,770
Leg, hind.....	18.4	51.2	15.1	14.7	-----	.8	890
Loin chops.....	16.0	42.0	13.5	28.3	-----	.7	1,415
Fore quarter.....	21.2	41.6	12.3	24.5	-----	.7	1,235
Hind quarter, without tallow.....	17.2	45.4	13.8	23.2	-----	.7	1,210
Lamb :							
Breast.....	19.1	45.5	15.4	19.1	-----	.8	1,075
Leg, hind.....	17.4	52.9	15.9	13.6	-----	.9	860
Pork, fresh :							
Ham.....	10.7	48.0	13.5	25.9	-----	.8	1,320
Loin chops.....	19.7	41.8	13.4	24.2	-----	.8	1,245
Shoulder.....	12.4	44.9	12.0	29.8	-----	.7	1,450
Tenderloin.....	-----	66.5	18.9	13.0	-----	1.0	895
Pork, salted, cured and pickled :							
Ham, smoked.....	13.6	34.8	14.2	33.4	-----	4.2	1,635
Shoulder, smoked.....	18.2	36.8	13.0	26.6	-----	5.5	1,335
Salt pork.....	-----	7.9	1.9	86.2	-----	3.9	3,555
Bacon, smoked.....	7.7	17.4	9.1	62.2	-----	4.1	2,715
Sausage :							
Bologna.....	3.3	55.2	18.2	19.7	-----	3.8	1,155
Pork.....	-----	39.8	13.0	44.2	1.1	2.2	2,075
Frankfort.....	-----	57.2	19.6	18.6	1.1	3.4	1,155
Soups :							
Celery, cream of.....	-----	88.6	2.1	2.8	5.0	1.5	235
Beef.....	-----	92.9	4.4	.4	1.1	1.2	120
Meat stew.....	-----	84.5	4.6	4.3	5.5	1.1	365
Tomato.....	-----	90.0	1.8	1.1	5.6	1.5	185
Poultry :							
Chicken, broilers.....	41.6	43.7	12.8	1.4	-----	.7	305
Fowls.....	25.9	47.1	13.7	12.3	-----	.7	765
Goose.....	17.6	38.5	13.4	29.8	-----	.7	1,475
Turkey.....	22.7	42.4	16.1	18.4	-----	.8	1,060
Fish :							
Cod, dressed.....	29.9	58.5	11.1	.2	-----	.8	220
Halibut, steaks or sections.....	17.7	61.9	15.3	4.4	-----	.9	475
Mackerel, whole.....	44.7	40.4	10.2	4.2	-----	.7	370
Perch, yellow, dressed.....	35.1	50.7	12.8	.7	-----	.9	275
Shad, whole.....	50.1	35.2	9.4	4.8	-----	.7	380
Shad, roe.....	-----	71.2	20.9	3.3	2.6	1.5	600
Fish, preserved :							
Cod, salt.....	24.9	40.2	16.0	.4	-----	18.5	325
Herring, smoked.....	44.4	19.2	20.5	3.8	-----	7.4	755

TABLE I—CONTINUED.

AVERAGE COMPOSITION OF COMMON AMERICAN FOOD PRODUCTS.

Food Materials (as purchased)	Refuse.	Water.	Pro- tein.	Fat.	Carbo- hydrates.	Ash.	Fuel Value per Pound.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calo- ries.
ANIMAL FOOD—Continued.							
Fish, canned:							
Salmon		63.5	21.8	12.1		2.6	915
Sardines	*5.0	53.6	23.7	12.1		5.3	950
Shellfish:							
Oysters, "solids"		88.3	6.0	1.3	3.3	1.1	225
Clams		80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	200
Lobsters	61.7	30.7	5.9	.7	.2	.8	145
Eggs: Hens' eggs	† 11.2	65.5	13.1	9.3		0.9	635
Dairy products, etc.:							
Butter		11.0	1.0	85.0		3.0	3,410
Whole milk		87.0	3.3	4.0	5.0	.7	310
Skim milk		90.5	3.4	.3	5.1	.7	165
Buttermilk		91.0	3.0	.5	4.8	.7	160
Condensed milk		26.9	8.8	8.3	54.1	1.9	1,430
Cream		74.0	2.5	18.5	4.5	.5	865
Cheese, cheddar		27.4	27.7	36.8	4.1	4.0	2,075
Cheese, full cream		34.2	25.9	33.7	2.4	3.8	1,885
VEGETABLE FOOD.							
Flour, meal, etc.:							
Entire-wheat flour		11.4	13.8	1.9	71.9	1.0	1,650
Graham flour		11.3	13.3	2.2	71.4	1.8	1,645
Wheat flour, patent roller process—							
High-grade and medium		12.0	11.4	1.0	75.1	.5	1,635
Low grade		12.0	14.0	1.9	71.2	.9	1,640
Macaroni, vermicelli, etc.		10.3	13.4	.9	74.1	1.3	1,645
Wheat breakfast food		9.6	12.1	1.8	75.2	1.3	1,680
Buckwheat flour		13.6	6.4	1.2	77.9	.9	1,605
Rye flour		12.9	6.8	0.9	78.7	.7	1,620
Corn meal		12.5	9.2	1.9	75.4	1.0	1,635
Oat breakfast food		7.7	16.7	7.3	66.2	2.1	1,800
Rice		12.3	8.0	.3	79.0	.4	1,620
Tapioca		11.4	.4	.1	88.0	.1	1,650
Starch					90.0		1,675
Bread, pastry, etc.:							
White bread		35.3	9.2	1.3	53.1	1.1	1,200
Brown bread		43.6	5.4	1.8	47.1	2.1	1,040
Graham bread		35.7	8.9	1.8	52.1	1.5	1,195
Whole-wheat bread		38.4	9.7	.9	49.7	1.3	1,130
Rye bread		35.7	9.0	.6	53.2	1.5	1,170
Cake		19.9	6.3	9.0	63.3	1.5	1,630
Cream crackers		6.8	9.7	12.1	69.7	1.7	1,925
Oyster crackers		4.8	11.3	10.5	70.5	2.9	1,910
Soda crackers		5.9	9.8	9.1	73.1	2.1	1,875
Sugars, etc.:							
Molasses					70.0		1,225
Candy ‡					96.0		1,680
Honey					81.0		1,420
Sugar, granulated					100.0		1,750
Maple sirup					71.4		1,250
Vegetables:							
Beans, dried		12.6	22.5	1.8	59.6	3.5	1,520
Beans, Lima, shelled		68.5	7.1	.7	22.0	1.7	540
Beans, string	7.0	83.0	2.1	.3	6.9	.7	170
Beets	20.0	70.0	1.3	.1	7.7	.9	160
Cabbage	15.0	77.7	1.4	.2	4.8	.9	115
Celery	20.0	75.6	.9	.1	2.6	.8	65
Corn, green (sweet), edible portion		75.4	3.1	1.1	19.7	.7	440
Cucumbers	15.0	81.1	.7	.2	2.6	.4	65
Lettuce	15.0	80.5	1.0	.2	2.5	.8	65

*Refuse, oil.

†Refuse, shell.

‡Plain confectionery not containing nuts, fruit or chocolate.

||Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material—skin, seeds, etc. The amount varies with the method of preparing the vegetables, and cannot be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

TABLE I—CONTINUED.

AVERAGE COMPOSITION OF COMMON AMERICAN FOOD PRODUCTS.

Food Materials (as purchased)	Refuse.	Water.	Pro- tein.	Fat.	Carbo- hydrates.	Ash.	Fuel Value per Pound.
VEGETABLE FOOD—Continued.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calo- ries.
Mushrooms	-----	88.1	3.5	.4	6.8	1.2	185
Onions	10.0	78.9	1.4	.3	8.9	.5	190
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	230
Peas (<i>Pisum sativum</i>), dried	-----	9.5	24.6	1.0	62.0	2.9	1,565
Peas (<i>Pisum sativum</i>), shelled	-----	74.6	7.0	0.5	16.9	1.0	440
Cowpeas, dried	-----	13.0	21.4	1.4	60.8	3.4	1,505
Potatoes	20.0	62.6	1.8	.1	14.7	.8	295
Rhubarb	40.0	56.6	.4	.4	2.2	.4	60
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	440
Spinach	-----	92.3	2.1	.3	3.2	2.1	95
Squash	50.0	44.2	.7	.2	4.5	.4	100
Tomatoes	-----	94.3	.9	.4	3.9	.5	100
Turnips	30.0	62.7	.9	.1	5.7	.6	120
Vegetables, canned:	-----	-----	-----	-----	-----	-----	-----
Baked beans	-----	68.9	6.9	2.5	19.6	2.1	555
Peas (<i>Pisum sativum</i>), green	-----	85.3	3.6	.2	9.8	1.1	235
Corn, green	-----	76.1	2.8	1.2	19.0	.9	430
Succotash	-----	75.9	3.6	1.0	18.6	.9	425
Tomatoes	-----	94.0	1.2	.2	4.0	.6	95
Fruit, berries, etc., fresh:*	-----	-----	-----	-----	-----	-----	-----
Apples	25.0	63.3	0.3	0.3	10.8	0.3	190
Bananas	35.0	48.9	.8	.4	14.3	.6	260
Grapes	25.0	58.0	1.0	1.2	14.4	.4	295
Lemons	30.0	62.5	.7	.5	5.9	.4	125
Muskmelons	50.0	44.8	.3	-----	4.9	.3	80
Oranges	27.0	63.4	.6	.1	8.5	.4	150
Pears	10.0	76.0	.5	.4	12.7	.4	230
Persimmons, edible portion	-----	66.1	.8	.7	31.5	.9	550
Raspberries	-----	85.8	1.0	-----	12.6	.6	220
Strawberries	5.0	85.9	.9	.6	7.0	.6	150
Watermelons	59.4	37.5	.2	.1	2.7	.1	50
Fruits, dried:	-----	-----	-----	-----	-----	-----	-----
Apples	-----	28.1	1.6	2.2	66.1	2.0	1,185
Apricots	-----	29.4	4.7	1.0	62.5	2.4	1,125
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,275
Figs	-----	18.8	4.3	.3	74.2	2.4	1,280
Raisins	10.0	13.1	2.3	3.0	68.5	3.1	1,265
Nuts:	-----	-----	-----	-----	-----	-----	-----
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,515
Brazil nuts	49.6	2.6	8.6	33.7	3.5	2.0	1,485
Butternuts	86.4	.6	3.8	8.3	.5	.4	385
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	915
Chestnuts, dried	24.0	4.5	8.1	5.3	56.4	1.7	1,385
Cocoanuts	†48.8	7.2	2.9	25.9	14.3	.9	1,295
Cocoanut, prepared	-----	3.5	6.3	57.4	31.5	1.3	2,865
Filberts	52.1	1.8	7.5	31.3	6.2	1.1	1,430
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,145
Pecans, polished	53.2	1.4	5.2	33.3	6.2	.7	1,465
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,775
Pinon (<i>Pinus deulis</i>)	40.6	2.0	8.7	36.8	10.2	1.7	1,730
Walnuts, black	74.1	.6	7.2	14.6	3.0	.5	730
Walnuts, English	58.1	1.0	6.9	26.6	6.8	.6	1,250
Miscellaneous:	-----	-----	-----	-----	-----	-----	-----
Chocolate	-----	5.9	12.9	48.7	30.3	2.2	5,625
Cocoa, powdered	-----	4.6	21.6	28.9	37.7	7.2	2,160
Cereal coffee, infusion (1 part boiled in 20 parts water)†	-----	98.2	.2	-----	1.4	.2	30

*Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

†Milk and shell.

‡The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage. Infusions of genuine coffee and tea like the above contain practically no nutrients.

By a careful study of the foregoing table, each individual, by experimenting, should be able to determine approximately the proportion of proteids, carbohydrates, fats, minerals and water necessary to completely re-supply the body waste and the energy used, and care should be taken not to overload the stomach with more than the body requires.

“For a temperate climate, it is estimated that the ration necessary to *sustain life* should consist of, proteids, 75 grams; fat, 40 grams; carbohydrates, 325 grams; producing calories, 2,000.

“The amount to be given out in the form of work should be added to these according to the amount of energy used. For a professional or literary life, proteids, 125 grams; fat, 125 grams; carbohydrates, 340 grams; producing calories, 3,500, constitutes a maximum amount for life and energy, and, proteids, 110 grams; fats, 90 grams; carbohydrates, 420 grams; producing calories, 3,000” constitute a minimum. Manual labor requires about one-third more than the maximum and minimum ratios for professional or literary work.

The average individual requires daily:

Nutrients	{ Proteids.....	4.2 ounces	
	{ Fats.....	2 ounces	
	{ Carbohydrates.....	17.6 ounces	
	{ Mineral.....	.8 ounces	
			24.6 ounces
Water.....		71.4 ounces	
Oxygen.....		30.2 ounces	
			126.2 ounces, or nearly 8 pounds

The 71.4 ounces of water in the foregoing table equals about 4½ pounds, or 9 glasses.

These elements may be supplied by different combinations of food, affording a greater or less variety in diet. The following rations give combinations required for daily re-supply of the elements in proportion.

	Amount of Food.	Proteids.	Fats.	Carbohydrates
	Ounces.	Ounces.	Ounces.	Ounces.
Beefsteak.....	8.0	1.9	0.7	---
Wheat bread.....	16.0	1.66	0.3	8.9
Potatoes.....	32.0	.64	---	7.0
Cabbage.....	6.0	.01	---	0.4
Milk.....	4.0	.01	0.1	0.2
Butter.....	1.0	---	0.9	---
Sugar.....	1.0	---	---	1.0
	68.0	4.2	2.0	17.5

By a study of the foregoing it will be noted that:

Of the beefs, dried, salted and smoked beef contain the largest proportion of proteid, next canned corn beef, next canned boiled beef, next rib rolls; of the steaks, porterhouse first and next round, while the tongue, shank and rump contain the least. Rib rolls are rich in proteids.

Next to beef, sardines, salmon, shad roe, herring, veal cutlets, and frankfort sausage rank in value as tissue builders in the order given, while salt pork, lobsters, oysters, crabs and bacon are least valuable.

Chicken has about two-thirds the proteid value of porterhouse.

In beef, veal and mutton, proteids compose from 14 per cent to 16 per cent of the edible portion.

Fish is a nitrogenous or proteid food; in its constituent elements it resembles meat. It contains no carbohydrates. It contains more water than meat, hence the proportion of proteid in fish is not so great.

Fat meat contains less proteid than lean meat.

Lean pork has less proteid than beef and mutton and the fat of any meat contains scarcely any water.

Cheese contains from 28 per cent to 30 per cent of proteid, dried beans and peas, 18 per cent to 25 per cent, while cereals contain from 7 per cent to 15 per cent, being most abundant in oats. Oats are also rich in fats and are one of the most valuable of the cereals for foods.

Bread contains about 9 per cent of proteid.

Fresh vegetables and fruit contain scarcely any proteid, often not more than 1 per cent.

Eggs contain 13 per cent proteid.

Patent flour, or the so called "high-grade" flour, yields less proteid than the entire wheat, the "low grade" or the graham.

The sources of fat in the diet are largely from the animal foods, though some fat is derived from the vegetable foods.

The fats in beef and veal range from 10 per cent to 40 per cent; in pork, over 80 per cent.

The majority of fish contains scarcely any fat, espe-

cially dried fish, though shad, salmon, sardines and mackerel contain from 5 per cent to 15 per cent.

Milk contains about 4 per cent of fat, its value in putting on flesh is partially in the amount of sugar and water it contains.

Butter is 85 per cent fat; it therefore yields much heat and energy.

Cheese has from 20 to 40 per cent fat, according to the richness of the cream.

The olive and cotton seeds are the chief sources of fat outside of the animal foods.

Nuts also contain a good percentage of fat.

Dried legumes contain a small proportion of fats, but in green vegetables and in fruits there is scarcely any fat.

The carbohydrates are found almost entirely in the vegetables and fruits. Animal foods, with the exception of milk, contain scarcely any carbohydrate.

The carbohydrates make up from 70 per cent to 80 per cent of the cereals, from 60 per cent to 70 per cent of the dried legumes.

The nutrients of sugar, honey and molasses are almost purely carbohydrate. Granulated sugar is 100 per cent carbohydrate. It is readily converted into fat and yields much energy.

Oysters and shell fish contain a small amount of carbohydrates. Generally speaking, a quart of oysters contains on an average about the same quantity of nutrition as a quart of milk, or three-fourths of a pound of beef or two pounds of fresh dried fish or a pound of bread.

Mineral matter occurs in almost all of the ordinary articles of food. Meats and fish contain about 1 per cent, milk contains about .7 per cent, the cereal from .2 per cent to 3 per cent, the green vegetables less than 1 per cent, and the dried legumes from 3 per cent to 4 per cent.

Of the vegetables, dried beans and dried peas alone contain a good proportion of nutrient. Fresh vegetables yield little energy—potatoes being represented by only 295 calories.

Cabbage, celery, cucumbers, lettuce, muskmelons, string

beans, green peas, green corn, onions, spinach, turnips and tomatoes contain over 75 per cent water.

Of the nuts, peanuts and almonds contain the largest proportion of proteids. Prepared cocoanuts, pinons, Brazil nuts, pecans, filberts and almonds contain the largest proportion of fats. Dried fresh chestnuts and prepared cocoanut contain the largest proportion of carbohydrates.

Chocolate and cocoa contain much fat.

“A man at hard muscular work requires one and two-tenths the food of a man at moderately active muscular work.

“A boy of 15 to 16 years requires nine-tenths the food of a man at moderately active muscular work.

“A man at sedentary occupation or at moderately active work, a boy from 13 to 14 years and a girl from 15 to 16 years require eight-tenths the food required by a man at moderately active muscular work.

“A woman at light work, boy of 12 and girl of 13 to 14 years require seven-tenths of the food required by a man at moderately active muscular work.

“A child from 6 to 9 years requires five-tenths the food of a man at moderately active muscular work.

“A child from 2 to 5 years, four-tenths the food of a man at moderately active muscular work.

“A child under 3 years, three-tenths the food required by a man at moderately active muscular work.”

A diet of cereals, root vegetables and milk, would contain an overabundance of starches, and would lack tissue-building proteids,—it would create energy and would require exercise to consume the fuel stored up, or the system would become clogged. In such a diet, milk would not be consumed in sufficient quantity to supply enough casein, or proteid. If, to this diet, a little cheese, meat or eggs and fruit be added, it will supply the elements required.

It must be borne in mind that proteids are necessary to re-supply tissues constantly being torn down by the body, and that fats, starches and sugars, must not be supplied in abundance unless required for active exercise; a diet should consist of about one-fourth proteid.

In studying the above table with reference to the reduction of fat, foods should be selected which contain the largest proportion of proteids with the smallest proportion of fats and carbohydrates.*

In putting on flesh, the diet should consist of a large percentage of fats and carbohydrates. It is unwise, however, for the average person to attempt to diet for reduction or for putting on flesh without intelligent direction, as so many physical conditions must be considered, because it is the amount of food assimilated and not the amount eaten which is effective. The physical strength and activity of the vital organs must be carefully considered; they should not be overloaded. One will build up or reduce more rapidly while practicing regular exercises for strength of the vital organs and nerve centers.

The regulation of health, then, depends upon regular exercise to create normal activity, both metabolic and muscular, and the regulation of the food to supply the elements necessary for nourishment and energy. Almost any system can be brought to health and strength.

Food for
Abnormal
Conditions.

Where the body is not in normal condition, because elements are lacking in the blood, these must be supplied in larger proportions with the food, and the case is one for a food chemist, or for one who has made food conditions a study,—not a case for medicine. If medical colleges will broaden their curriculum, or physicians broaden in their practice, and undertake the care, or cure of disease through natural means, the relief will be with this profession. If they do not, relief will lie in the establishment of broader professional schools for the education of the physical culturist and food specialist.

The foundation education upon foods, belongs in the public schools. How many lives are lost on account of the lack of knowledge of food values will never be known.

The system readily excretes an excess of vegetable products, and no acute difficulties result; however, such *chronic* difficulties, as Constipation, Torpid Liver and Indigestion, frequently result from an excess of vegetables

Publishers' Note.—The diet for reduction and building flesh is considered in Miss Cocroft's lecture upon "Obesity and Leanness."

containing too much starch, if sufficient exercise has not been followed to burn up the excess of carbon. On account of the readiness to putrefaction of proteid products, care should be taken not to consume these in too great proportion,—especially the flesh of animals.

Broadly speaking, a proteid diet, with a freedom from carbohydrates, rests the liver and a diet of carbohydrates, with a freedom from proteids, rests the stomach, unless overloaded, because these are passed through the stomach for action by the intestinal juices.*

A study of the habitual tastes for foods, in connection with the physical ailments of 18,000 women, shows that by the constituents in the blood, and the condition of the different organs of the digestive system, one can determine which food the individual has formed a habit of eating, because the blood will show a lack of the elements which the patient has denied himself on account of his likes and dislikes.

It is necessary to change the mental attitude toward certain foods before the system will assimilate them; thus a taste should be cultivated for foods which the body requires.

It will usually be found that the anæmic individual has no taste for vegetables containing iron, or for meats rich in albuminoids, or, that these foods have been denied because of their scarcity; therefore, the elements necessary for red blood corpuscles have been deficient.

Every mother, with growing children, should be a thorough student of the chemistry of food. If the child's bones do not grow to sufficient size and strength, care in the selection of foods, rich in proteids, lime, magnesium and phosphates, may correct it. If the blood is lacking in red corpuscles, as in anæmia, the diet should contain iron and sufficient albuminoids to build the blood corpuscles. Spinach and beets contain much iron.†

Where the child stores up too much fat, care in the amount of exercise, and of oxygen consumed, is of vital importance; the blood should be examined to ascertain

*See lecture upon "The Vital Organs," by Susanna Cocroft.

†See page 20 of "The Circulatory System," by Susanna Cocroft.

that it is not lacking in red or white blood corpuscles, and a diet not too prolonged, eliminating an overabundance of fats and too much of carbohydrates, should be followed. If the child remains thin and pale, attention must be given to the nerves, the digestive system, the blood, nourishing food, deep breathing and exercise of vital organs.

**Economy
in Food.**

The food which furnishes the most nutriment and yields the most heat and energy, with the least refuse, is the economical food; and in the selection of food for any individual the result to be gained from the food must be borne in mind. If one is doing heavy muscular work, more proteid or tissue building food, as well as carbohydrates and fats, are required to produce energy and rebuild tissue than if one's habits of work are sedentary. In strong mental work, where the brain is continually active, proteids are also required to re-supply the brain tissue, but the fats and carbohydrates may be lessened. This would seem to contradict the theory that where one's habits are sedentary and the brain alone is active, the proteid elements are not required. In sedentary occupation the carbohydrates and fats are stored within the system, clogging it and producing torpid liver, constipation and obesity, unless the brain is sufficiently active to use all of the fuel in brain energy.

In a dietary study of the foregoing table, the question should be to provide the largest amount of nutriment at the lowest cost, with due attention to palatability and variety. In the selection of meats, for instance, while beef steak may cost twice the amount of beef stew, it must be borne in mind that beef steak, especially if it be largely of muscle, contains very little waste, contains a large proportion of albuminoids, or the tissue building substances, while in the beef stew the bones and the connective tissue predominate; the proteids yielded from the beef stew are a large proportion gelatinoids and extractives,—not the tissue building substances. This would not hold in comparing the cheaper and the more expensive cuts in the same kind of beef steak; the cheaper cuts often yield quite as much nutriment.

Digestion.

The digestibility of food depends largely upon the condition of the individual, and upon the normal amount of digestive juices being poured into the alimentary canal.

Digestion is practically synonymous with solution, all solid foods must become soluble through digestive juices and water before they can pass through the walls of the digestive tract.

It may be well to here trace briefly the progress of the food through the digestive tract and the action of the juices and the ferments upon it:—The food in the mouth is mixed with the saliva, which dissolves the starches, converting them into sugar. It is, therefore, important that sufficient saliva be mixed with the food and, for this reason, it is unwise to drink liquids while the food is in the mouth. The food must be thoroughly chewed, that it may be readily mixed with the saliva and with the gastric juices.

The suggestion, in regard to the abstinence of liquids while the food is in the mouth, does not apply to drinking liquid at rest periods during the meal and before and after the meal. Water in the stomach dilutes and dissolves the food, so that it is more freely acted upon by the gastric juices and more freely absorbed through the digestive walls. It also increases peristaltic action. Water, not too hot, stimulates the nerves of the mouth and the stomach, inciting the flow of saliva and the gastric juices. The absorbing and secreting cells of the mucous lining of the stomach act more freely when it is moderately full; thus water drinking at meals aids digestion.

In building up about 7,000 cases of thin women results show that water at meals has a tendency to put on flesh. Probably one reason for this is because of the cleanliness and greater freedom given to the absorbing and secreting cells of the mucous lining of the digestive tract, as well as the stronger peristalsis.

As the food enters the stomach, the gastric juices pour out from the mucous lining, very much as the saliva pours into the mouth. These juices act upon the proteids.

The muscular movements of the stomach force the food

down the stomach, mixing it with the gastric juices as it passes; when the food reaches the lower end of the stomach, if it has been properly dissolved, it is forced out of the stomach into the intestines.

The first twelve inches of the small intestine is known as the duodenum. In the duodenum the food is acted upon by the pancreatic juice from the pancreas, the bile from the liver and the intestinal juices. These juices act upon both proteids, fats and carbohydrates, the bile emulsifying the fats, while the pancreatic and intestinal juices act chiefly upon the carbohydrates.

A small part of the food is absorbed by the stomach, but the large part is absorbed in the intestines; the fats are absorbed almost entirely in the small intestines.

The food is forced along the intestinal tract by peristaltic or muscular relaxation and contraction waves, as in the stomach; as it is so forced, the nutrient elements, after being put in condition for absorption, are taken up by the portal veins and the lacteals of the submucous lining.

The large part of the food is carried to the liver by the portal veins where the impurities are separated and where the blood corpuscles are formed, before it enters the blood stream through the hepatic vein.

In digestion, it is of the utmost importance that the muscular, mucous and the sub-mucous coats of the stomach, and intestines, be kept thoroughly strong and active, so that the gastric juices may be freely poured out, the nutriment be freely absorbed and the food be moved along the digestive tract; therefore, daily exercise which calls a good circulation of blood to these organs and keeps them strong is imperative.*

Dr. Beaumont states that from 2 to 4 hours are required for digestion of food in the stomach, depending upon the quantity and quality of the food and the condition of the stomach. The time ordinarily required for digestion of the fibrous parts of meat, white bread, etc., is from 3 to 3½ hours, depending upon the amount and the consistency.

Publishers' Note.—The study of Absorption and Assimilation through the lymph channels is thoroughly discussed in Miss Cocroft's lecture upon the Circulatory System.

“Fluids leave the stomach more rapidly than solids. Seven ounces of water leaves the stomach in $1\frac{1}{2}$ hours, seven ounces of boiled milk in about two hours. The most readily digested animal foods remain less time in the stomach. Meat, as a rule, is easily digested, because the action of the digestive juice of the animal has converted the starches and sugars. The white meats of chicken being soft, remain a shorter time than the red or the dark meats.”

The method of cooking, and the degree of nerve tension, also materially affects the digestion.

One of the most remarkable, and the least understood of any of the assimilative and absorptive functions, is that any one part of the body has the power of appropriating from the foods the elements necessary for its own rebuilding, while these same elements would pass through other organs untouched. The body has the power also of not only making use of the foods for nutriment, but in a dearth of foods, in using up the blood tissue itself. Just how this is done is also a mystery.*

It is now believed that a larger proportion of food is digested and absorbed than was heretofore realized, and that the excretions from the intestines are in many cases made up almost entirely of refuse, and the katabolic waste of the system. In an ordinary mixed diet it is stated that about 92 per cent of the proteids, 95 per cent of the fats and 97 per cent of the carbohydrates are retained by the body.

Any discussion in regard to the digestibility of foods must be general, because food which agrees with one may disagree with another, and a food which disagrees with one at a particular time may entirely agree with him at some other time; therefore, before one passes upon the adaptability of a food to the individual, it should be known that this food agrees or disagrees with him under varying conditions. Each individual should learn to like the foods which experience and blood tests have shown to be lacking in his case. The question of likes and of dislikes in regard to foods, is largely habit, and one can learn to like almost any food one wishes.

When one is exercising freely, so that the muscular and mucous coats of the digestive system are strong, the body will handle foods, which during sedentary habits it would not digest. There are kinds of foods, however, which to certain individuals, according to the chemical composition of the body, are an actual poison, e. g., strawberries, cheese or coffee.

**Influence of
the Mind.**

The state of the mind has more to do in regulating the digestive system than the average scientist has given it credit. Cheerful thoughts put the nerves of the entire organism in a natural state, while disagreeable thoughts put the nerves in a tense, unnatural condition—the nerves to the digestive system being effected by the tensivity of the mind, just as the nerves to any other part of the body. As an illustration of this: if one thinks ugly, disagreeable thoughts for a continued period, actual illness results. These thoughts effect the digestion in such a manner that the appetite sometimes entirely wanes. All so-called “new thoughts,” “orgies,” or “isms,” conducive to the formation of the habit of looking upon the bright side of life, or of looking for good and joy in life, put the nerves in a natural state, effecting the digestion and consequently the health. The practice is *Christian Sense*.

The nerves control, to a great degree, the peristaltic movements of the stomach and the action of the absorption cells, as well as the cells which pour out the juices. Thus it is that a food which one likes is not only more palatable, but it will digest more readily, because the digestive juices flow more freely.

The importance of dainty service in a sick-room, because of the psychic effect of a meal daintily served, is of utmost importance. The sight of a meal served upon soiled linen will pervert the appetite, while a meal daintily served upon dainty linen, with garnishings and tasty table decorations, incites the flow of gastric juices.

Sometimes the sight of quantities of food turns one against it. The custom among hearty eaters, of serving a plate too plentifully, perverts the appetite of one whose digestion is not so hearty.

It is well, therefore, to begin the meal with something which tastes particularly good, that the flow of these juices may be incited. For this reason, if one cares for fruit, it is an excellent custom to begin the meal with fruit, or with soup containing proteid extractives which stimulate the flow of digestive juices. The habit of finishing a meal with some tasty dessert, is based upon the scientific principal that by so doing the gastric juices will flow more freely after the meal, thus aiding in its digestion.

The careful wife and mother who notes the failing appetites of members of her family, should attend carefully to the garnishing of her dishes and to serving them in a neat, attractive manner; also to changing, as far as may be with consistency, her table decorations, so that the eye as well as the sense of smell and taste may be pleased.

Pure Foods. While much harm is doubtless done by the compounding of various foods in the form of pastry, puddings and confections, more harm is done in the adulteration of foods by those of inferior quality, or by foreign ingredients.

It is stated by those who have made the question a study, that 45 per cent of the cost of a very large number of foods prepared by manufacturers is paid for adulterants. The greedy gain, and the infection to "get-rich-quick," doubtless means that this pernicious adulteration will continue until the government passes strict laws insuring pure foods, and sees to it that these laws are executed. Until we can know just what each prepared food, jam, jelly, syrup, preserve, molasses, coffee, etc., contains, let us avoid them.

The best plan for the housewife, is to prepare her own foods from the natural simple elements in her garden or upon the market, putting up her own preserves, jams, jellies, pickles, syrups, grape juice, etc., and dealing, as far as possible, directly with a miller whom she can trust. This means to come back to simple living, which is one step toward the "simple life."

Since economy in food is in the least amount of money

paid for the greatest amount of nutriment, or of fuel value, if our prepared foods contain 45 per cent of adulterants—which are neither nourishing nor productive of energy, but consist partially of chemicals injurious to the system, even though they be cheaper, they are not economical. The simple foods prepared in the home, and prepared simply, with a care to the consumption of no more than the system requires, is the truest economy in health and in doctor's bills. It is not more brands of prepared food which is needed, but purity of elements in their natural state. A dish of wholesome, clean oat meal has more nourishment and more fuel value than the average *prepared* food.

In the efforts to impress upon the mind of the reader the importance of pure food in amount and quality, the importance of pure air and pure water must not be overlooked. Pure air containing a normal amount of oxygen is absolutely necessary, that the system may digest and assimilate the foods consumed. Much infection is carried by these two elements.

Briefly summarizing the foregoing points:

Food is required to build up the body tissue and to yield heat and energy.

The proteid foods, albuminoids, (examples of which are lean meat, eggs, the casein of milk and the gluten of wheat) build blood, tissue, muscle, bone and sinew.

The gelatinoids of the proteids (examples,—gelatin, cartilage, gristle and tendons of meat) are a reserve to protect the tissues from being used as energy in the absence of fats or carbohydrates. They do not form muscle, bone nor sinew.

The extractives of the proteids, (meat extracts) stimulate the appetite and increase the flow of gastric juices.

The fats (butter and the fats of olives, nuts and grains) yield heat and energy.

The carbohydrates (sugar and starches) are stored in the body for heat and energy, when the fats are consumed.

Mineral matters form bone and teeth, and assist in digestion. They are phosphates of lime, magnesium, potash, soda, sulphur, calcium, etc.

All foods serve as fuel to yield heat and energy; the fats are used first, next the carbohydrates and lastly the proteids.

The digestibility of food depends upon the normal activity of the digestive organs, upon the amount of oxygen taken into the system, upon the amount of liquids consumed, upon the normal amount of digestive juices being eliminated, and upon the normal condition of the mind.

Cooking.

The cook who mixes food should receive as thorough an education and preparation for her art as does the pharmacist who mixes medicine. When this is realized, cooking will be regarded as a dignified profession, and the servant problem largely answered.

As a rule, unless one is an analytical chemist, it is safer to eat food singly, instead of combining starches, sugars and proteids into various puddings, pastries, etc.

Many foods are improved by cooking, while ripe fruits are doubtless better eaten fresh. The carbohydrates are in the form of cells, the covering of these cells being composed largely of nitrogenous, or proteid matter. The proteid substance is not acted upon by the saliva, and the nitrogenous matter is better dissolved, so that the carbohydrates can come in contact with the saliva, if it is broken or softened by cooking.

Since the root vegetables and the cereals, contain a large proportion of carbohydrates, they should be well cooked, in order that the cells may be fully dissolved. This is especially true of oatmeal. This dish should be soaked over night and then cooked at least 45 minutes in a double boiler, or if not soaked over night, it should cook slowly for at least three hours.

Vegetables should be cooked in soft water, as the legumes of the vegetables become well nigh insoluble with lime or magnesia.

Generally speaking, cooking aids the digestibility of carbohydrates and lessens the digestibility of fats and proteids; fats are readily absorbed in their natural condition, but when subject to a high degree of heat, as in frying, they become irritants.

Vegetables, or starches in any form, when fried in fat become coated with the fat, which at the heat required for frying, becomes an irritant, and the coating prevents the necessary action of heat or of the digestive ferments upon the starch globules.

Pastry owes its harmful character to this interference of fat with the proper solution of the starch—at least such pastry as requires the mixing of flour granules, as the coating of these granules with fat prevents them from coming in contact with liquids and the cells must absorb water, swell and burst before they can be dissolved. The fat does not furnish sufficient water for this and so coats the starch granules as to prevent the absorption of water in mixing, or of the saliva in mastication. This coating of fat is not relieved until late in the process of digestion or until the food reaches the intestines. This same objection applies to rich gravies, unless the flour be dissolved in water and heated before being mixed with the fats. The objection to pastry, therefore, is to such as is made by mixing flour with fat; it does not apply to most puddings.

The heat in cooking also destroys such germs as may be, and almost always are, present in both vegetable and animal matter; examples of these are the parasites, such as the tape worm in beef, pork and mutton, and trichanæ in pork. Vegetables and fruits become contaminated with the eggs of numerous parasites from the fertilizers applied to them; hence they should be thoroughly washed.

Heat brings out the extractives in the proteid matter, giving to the food a savory smell. It also softens and loosens the gelatenoids of the connective tissue.

The object of cooking bread, cakes, etc., is to make the combined elements more porus, and thus easier to dissolve. Porous substances are much easier permeated by the digestive juices than are solids.

Heat in cooking causes a combustion of the carbonic acid gas and the effort of this gas to escape, as well as the steam occasioned by the water in the food, causes the bubbles. When beaten eggs are used, the albuminoids in the bubbles expand the walls, which stiffen with the heat and cause the substances containing eggs to be porous.

Highly seasoned food tends to weaken digestion by calling for an undue secretion of digestive juices, which if prolonged tire out the glands.

Meat extracts, coffee, tea, cocoa and the alcohol of wine, or other beverages, go directly into the blood and affect the nerves. Excessive use of coffee or tea is deleterious to the health just as an excessive use of alcohol.

Sugars. All sugars are carbohydrates, or, carbon, hydrogen and oxygen, the oxygen and hydrogen being in the same proportion as in water, which is made up of two atoms of hydrogen and one of oxygen, the difference being that in the water the carbon is missing. Sugar is said to consist of about 95 per cent nutritive value. Before sugar or starch, in the form in which it is known, can be used by the human system, it is changed into dextrose or another form of sugar, which is burned to yield heat and muscular energy. Grape and milk sugar need no chemical change, but are taken at once into the circulation. When an excess of sugar is used, it is stored within the body until required.

Sugar is perhaps a better food than starch from the fact that less force is required for its digestion, being readily converted into dextrose. In limited amounts, according to the amount of muscular or brain energy used, it is therefore one of the best foods for the production of energy, and is especially adapted to one doing heavy muscular work. It is also said to prevent fatigue, a man being able to do 75 per cent more muscular work with less fatigue after consuming about 17½ ounces of sugar dissolved in pure water. It furnishes the needed carbohydrate material to organisms that have no power to digest starch. Thus milk sugar is a part of the natural food for the infant. In times of great exertion or exhausting labor, the

rapidity with which it is assimilated gives it advantages over starch.

Like starch, sugar is fattening and should be sparingly used by the corpulent, but as freely used as the system can handle it by those who wish to build up in flesh. Broadly speaking, about one-fourth of a pound of sugar daily, in connection with other foods, is well utilized by the system, the amount depending upon whether one leads an active or a sedentary life. In the consumption of candy, it is necessary to know that it be made of pure sugar. A large amount of cane sugar and of molasses are made from glucose, which, while not injurious to the system, will overload it easily and it undergoes fermentation readily. The desire of the child for sweets is a natural one from the fact that the child uses so much energy and sugar supplies this energy with less effort of the digestive system. When the child begins to eat more solid foods, it becomes sated by the sugar in these foods and is no longer attracted by the mild sweetness of fresh milk. Where the child turns against milk, it is well to cut down the allowance of sugar in the hope of restoring the taste for this valuable food. Many of the best authorities state that the child, up to its third year, should never be allowed to taste sweets, in order that the appetite may not be perverted from the natural sweets of the milk.

Sugar is better supplied the child in a lump or in home-made candy, rather than in the sweetening of porridge, oatmeal or bread and milk, etc. Sweet fruits, fully ripened, contain much sugar and should be freely given to the child.

Harvesters, road-makers and others, who do hard work in the open air, can consume large amounts of sugar in pie, pastry, etc., which are difficult to digest; while one who lives an indoor life, should refrain from an undue amount of these, because they will bring indigestion sooner or later.

The natural flavor of fruits and grains is very largely destroyed by the use of sugar, which is used too freely on many articles of diet.

For one who is under-nourished, sugar is a desirable food, if the starch is diminished in proportion as the

amount of sugar is increased, but the inclination in sweetening foods, is to take more starch than the system requires, as it is the carbohydrate foods which are ordinarily sweetened,—not the proteid foods.

Eggs.

Eggs consist chiefly of two nutrients, proteid and fat, combined with water, phosphorous and ash. The yolk and the white differ in composition. The yolk contains considerable fat and ash, while the white practically is free from fat and has very little ash. The white and the yolk contain almost equal amount of proteids.

The white of the egg is said to be pure albumen; the chief ash constituent is common salt. The total phosphorous in the white of the egg is equivalent to about 2 per cent phosphoric acid and the total phosphorous in the yolk is equivalent to 1 per cent.

Eggs also contain sulphur. The dark stains made by eggs on silver is due to the sulphur contained in them.

Eggs are, no doubt, excellent articles of food for nutrition and for tissue building. They contain more water than cheese, but are more concentrated than milk or oysters. They occupy practically the same relative value in the diet as meat, and make a very good substitute for meat.

Egg yolk in abundance is often prescribed where it is necessary to supply a very nutritious and easily assimilated diet.

An egg should be eaten raw or cooked slightly. Where the egg is cooked hard, the albumen coagulates in such a manner as to make it difficult of digestion. "Hard boiled and fried eggs require $3\frac{1}{2}$ hours for digestion in the stomach. Soft boiled 3 hours, roasted $2\frac{1}{2}$, raw eggs not whipped 2 hours, raw eggs whipped $1\frac{1}{2}$ hours. It is determined by experiment that eggs, oysters and white bread require about the same length of time for digestion. It is probable that there is no difference in the thoroughness of the digestion of hard and soft boiled eggs, excepting that those that are boiled hard take the longer time."

Eggs are best cooked by being brought to a temperature of about 180 degrees, and then left at this tempera-

ture, or below it, for about fifteen minutes; the yolks will become mealy and the albumen will be soluble.

Meats. It is possible to combine the fat and the lean of meat so as to meet the requirements of the body without waste, while there is always much waste in vegetable matter. The compounds contained in the animal foods are much like those of the body; therefore, they require comparatively little digestion to prepare them for assimilation—this work having been done by the animal—while the vegetable compounds require much change by the digestive system, before they can be converted into use.

About 97 per cent of meat consumed is assimilated by the system, while a large part of the vegetable matter consumed is excreted as refuse. Roasted flesh seems to be more completely digested than boiled meat, but raw meat is more easily digested than cooked.

Roasted chicken and veal are tender, easily masticated and easily and rapidly digested in the stomach. This is one reason why the white meats are considered a good diet for the sick-room, especially in the case of stomach difficulty. Fat meats remain in the stomach a much longer time, thus gastric digestion of pork, which is largely fat, is especially difficult, and fried pork, in which the fat is heated to a very high degree is unfit for food.

The manner of cooking meat depends upon the purpose which it is intended to serve. If the purpose be to make soup and to use all of the extractives in the connective tissues and the bone marrow, the meat should be put into cold water and gradually heated. The albumen of meat is largely in the blood and it is the coagulated blood which forms the scum on soup if heated above a certain point; thus the cook who skims off the scum destroys much of its nutrient value; and clear soups contain very little nutrition.

If the object is to eat the tissue itself, meat should be put into hot water, so that the albumen on the surface may be immediately coagulated and prevent the escape of the nutrients into the water. It is impossible to make a rich broth and to have a juicy, highly flavored piece

of boiled meat at the same time. In stewing meat, where it is desirable to use both the fibre of the meat and the broth, it should be put into cold water and raised to about 180 degrees F., where it should be kept for some hours.

Preserved and canned meats should be eaten with the utmost caution, not only because of the inferior meat used in the preparation of these foods, but also from the fact that they may become putrid after being canned.

When meat alone is to be eaten without reference to the extractives, more of the flavor and juice of the meat are retained by roasting it. If it be put into a hot oven with a little suet over the top, so as to sear the meat with hot fat and no water be put in the pan, it will retain the juice and the flavor. Water draws out the extractives. It is important to remember that the smaller the cut to be roasted, the hotter should be the fire. An intensely hot fire coagulates the exterior and prevents the drying up of the meat juice. After the surface is coagulated and seared it should cook slowly.

Tannic acid toughens meat fiber, hence it is used in tanning leather; tannic acid which forms in tea should be avoided for the same reason, as it renders the fibers difficult of digestion.

Bread.

There is perhaps no form of prepared food which has been longer in vogue than bread. It has been known since history began. Bread probably maintains and supports life and strength better than any other single food, excepting milk. The ease with which it is digested depends very largely upon its porous condition. When full of pores, it is more readily mixed with the digestive juices.

A kernel of wheat is made up of six outer layers, known as the bran, the three outermost of which are called the skin. The three innermost form the envelope of the seed proper. It is the fourth layer (counting from without) of the bran which contains the greater part of the coloring matter. The innermost layer of the bran is filled with nitrogenous substance, known as cerealin. Within the cerealin layer is the endosperm, which constitutes the largest

part of the grain and contains the starch granules. At the lower end of the grain, almost surrounded by the endosperm, is the germ or embryo.

Wheat is composed of:

First—The nitrogenous or protein compound typifying the white of egg, or the lean of meat. This is chiefly represented in the cerealin and the gluten. If so-called gluten flour be made of the pure wheat gluten it is valuable proteid food and is not fattening.

Second—The carbon extracts found mainly in the endosperm, which is the most important contributor to the flour.

Third—The fats occurring chiefly in the germ of the grain.

Fourth—The phosphorus and other mineral matter which is found chiefly in the bran.

It will be noted that where the bran is omitted, the bread has very little value as food for brain, nerve or bone, thus wheat, to be of the most value, should contain the entire grain. The bran is also valuable in increasing peristaltic action in the intestines and relieving the tendency to constipation.

Gluten is an easily digested proteid. Mixed with water, it forms a tenacious body which expands under the pressure of the gas from the yeast until the dough is full of gas-filled holes. The walls of the gluten do not allow the gas to escape, and thus the dough is made light and porous. The more gluten the flour holds, the more water it will take up in the dough, and the greater will be the yield of bread; hence, the more gluten the more valuable the flour.

Yeast, which is really a mass of tiny plants, reproduces itself very rapidly, causing alcoholic fermentation, or a giving off of carbon dioxide (carbonic acid gas). The carbon dioxide is held by the gluten and the effort to escape produces the pores in bread. The usual temperature at which fermentation best takes place is about 170 degrees, but fermentation is stopped by the extreme heat of the oven, and bread must, therefore, be thoroughly

baked. It is claimed that once baking does not entirely stop fermentation, however, hence the theory that bread should be twice baked. A thick loaf is best eaten after it has been baked 24 hours, though it is said to be "done" after 10 hours. Thin biscuits do not show the same ill-effects when eaten hot as does bread.

The digestibility of bread depends upon its lightness. The objection to hot bread is largely due to the fact that it forms a more solid mass upon coming in contact with saliva in the mouth, and with the gastric juices and is thus less easily digested.

"Entire wheat bread does not, as might be expected from its name, contain all of the wheat. The three outer layers of the grain, consequently the phosphorous or brain nerve and bone builder, have been removed. The graham flour contains the whole grain, and where the whole grain is used, the proteids are furnished in larger amounts.

Mould, which sometimes forms upon bread, is, like the yeast, a minute plant, which is floating about everywhere in the air, ready to settle down wherever it finds a suitable home.

Milk contains the three classes of nutrients, but not in the proportion for adults in health. An adult would have to drink too large a quantity to gain the nourishment needed.

Bread contains the three classes of nutrients in about the right proportion, but in order to get the required amount of proteid, it is necessary to take more carbohydrates than is otherwise required.

The power of the system to throw off food, over and above the needs of the body, is a wise provision of Nature, because where foods are not supplied in the proper proportions, a larger diet is necessary, and the system can select such foods as it needs.

LECTURES *by* SUSANNA COCROFT

GROWTH IN SILENCE

"Enter into thine inner chamber and shut the door."

"There is a divine sequence, a golden thread running through the lives of all men and women of truly great and lasting power."—R. W. TRINE.

A GOOD FIGURE—OBESITY, LEANNESS—(Illustrated)

"Style is in the carriage, not in the gown."

"No woman is to blame for not being beautiful at sixteen, but she has only herself to blame if she is not beautiful at forty."—FRA LIPPO.

"Few women know how to stand, to sit or to walk without undue expenditure of nerve force."

IDEALS AND PRIVILEGES OF WOMAN

"The normal woman is happy if well."

"Her first duty is to herself. To be a good mother she must first be a perfect woman."

"She has not only her rights as a true woman, but the devoted homage and service of man."

THE CIRCULATORY SYSTEM—Heart, Lungs, Arteries, Veins, Lymphatics and Blood

Miss Cocroft has spent years in the practical study of anatomy and physiology. This lecture follows the blood from the heart on its complete circuit of the body back to the heart—showing the dangers and results of sluggish and of impure blood flow, with resultant physical ailments and their relief. No student of physiology should be without it.

BODY MANIKIN AND POSITION OF VITAL ORGANS

The body manikin with but few additions is sold to physicians for \$5.00. This manikin is printed in seven colors and includes fourteen different plates, showing the muscles, blood vessels, nervous system, the organs of respiration, digestion and all other vital organs, each in its exact relation to the other. It enables a woman to look within her *physical self* and to understand the many facts about herself which Miss Cocroft explains in her lessons—facts which every woman, wife and mother should know—facts which it is a sin for her not to know.

CHARACTER—As Expressed in the Body—(Illustrated)

"How can I hear what you say when what you are is forever thundering in my ears."—EMERSON.

True grace is visible expression of graciousness.

Grace, womanly dignity, self control, ease of manner, laziness, indifference, lack of energy and ambition, moral weakness, or moral courage, each has its expression. Not only how to thus read character, but how women can best express it in herself is the theme of this address.

"The secret of the highest power is in uniting the outer agencies of expression with the power that works from within.

THE NERVOUS SYSTEM

Many of woman's physical ills are traceable to shattered nerves, and many such ills yield with astonishing readiness to the influence of a rightly directed mind. How and when to thus treat the physical by the mental is told in this lecture, which also includes a clear description of the nervous system, its functions and its influence upon the various parts of the body.

MENTAL POISE—SELF-SUFFICIENCY

"The great man is he who, in the midst of a crowd, can keep with perfect sweetness the serenity of solitude."—EMERSON.

EFFECT OF HABIT UPON LIFE—FOODS

Habit is a marvelous gift of nature. Rightly used, it lengthens life and is a great conservator of energy. Wrongly developed habit is a check to growth. Habits of eating greatly influence health and these are treated in the chapter about Foods.

MOTHERHOOD

The life, the vitality, the mental capacity, the moral character of the child depend directly upon the strength, the character, the mental attitude of the mother. Motherhood is woman's most sacred privilege and the true mother finds greatest joy in fitting herself to fulfill that privilege in the most beautiful way. How woman may best equip herself for motherhood and how the mother may preserve herself and prolong her usefulness to her children, is clearly set forth in this lecture.

THE VITAL ORGANS—Liver, Stomach, Intestines, Kidneys—their Use and Abuse

The whole treatise is so lucid and so simply told that all can perfectly understand it, and the body manikin shows the organs referred to and renders the explanations absolutely clear. This lecture is full of practical, everyday health hints.

AIDS TO BEAUTY—Skin, Hair, Eyes, Teeth, Hands, Feet and Ears

Life is made up of little things—and so is beauty. No woman can be truly beautiful or wholesome who neglects the details of her toilet. Indeed, these little things are a constant index of character. This lecture gives many health and beauty hints which some women have paid hundreds of dollars to learn.

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